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ABSTRACT

Project RETOOL's goal was to provide a quality training program in special education technology for teacher educators. The training was designed for higher education faculty who had mastered the basics of microcomputer operations and applications in special education. Project staff, in cooperation with consultants and trainers and with the support of Council for Exceptional Children staff: (1) formed a Project Advisory Council; (2) identified microcomputing competencies needed by higher education faculty members who are preparing special education personnel; (3) located or developed training modules on microcomputer applications in special education; (4) field tested the training packets; (5) conducted training for post-doctoral leadership personnel on the competency-based training modules; (6) conducted training for teacher educators on three authoring systems developed specifically for special education; (7) disseminated project information and products; (8) evaluated the project's activities, products, and processes; and (9) maintained a project management system. Training materials focused on "AppleWorks," "Electric Desk," authoring systems, telecommunications applications, expert systems, hypermedia, interactive videodiscs, and adaptive and assistive devices. Appendixes include a list of the members of the Project Advisory Council, a copy of a paper by A. Edward Blackhurst et al. titled "Microcomputing Competencies for Special Education Professors," samples of promotional materials, a table showing the geographic distribution of training participants, and project evaluation data. (JDD)

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PROJECT RETOOL:

TRAINING IN ADVANCED TECHNOLOGY APPLICATIONS FOR POST-DOCTORAL LEADERSHIP PERSONNEL

GOO 8630053-88

FINAL REPORT

SPECIAL PROJECTS

Submitted by

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EC 232009

BEST COPY AVAILABLE

THE COUNCIL FOR EXCEPTIONAL CHILDREN

August 30, 1989

U.S. Department of Education
Office of Special Education and Rehabilitation Services
Division of Personnel Preparation
Washington DC, 20202

Fellow Educators:

The enclosed document represents the final report of Project RETOOL: Training in Advanced Technology Applications for Post-Doctoral Leadership Personnel. On behalf of the Teacher Education Division of The Council for Exceptional Children, I would like to thank OSERS staff for the cooperation that contributed greatly to the success of this project. A special thank goes to Dr. Norman Howe, Dr. Robert Gilmore, and Ms. Daphne Weeden for their advice and support.

Sincerely,

Elizabeth Byrom

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OVERVIEW

The goal of Project RETOOL has been to provide a quality training program in special education technology for teacher educators. The training was designed for higher education faculty who have mastered the basics of microcomputer operations and applications in special education.

The project successfully completed nine objectives:

1. To form a Project Advisory Council (PAC) of teacher educators who are knowledgeable about special education technology.

2. To identify microcomputing competencies needed by faculty members at institutions of higher education who are preparing special education personnel.

3. To locate or develop training modules on microcomputer applications in special education that can be used in special education personnel preparation programs.

4. To field test the training packets with special education teacher educators.

5. To conduct training for post-doctoral leadership personnel on the competency-based training modules.

6. To conduct training for teacher educators on three authoring systems developed specifically for special education.

7. To develop mechanisms to disseminate project information and products on a national basis.

8. To evaluate the project's activities, products, and processes.

9. To maintain an efficient and effective project management system.

The following section describes the project's major activities.

ACCOMPLISHING THE OBJECTIVES

Objective 1: Project Advisory Council

The Project Advisory Council met twice annually during the three years of the project. The meetings were held in conjunction with a) CEC's annual conventions in Chicago, Washington DC, and San Francisco and b) the annual conferences of CEC's Teacher Education Division in Atlanta, Alexandria, and Salt Lake City.

PAC members assisted with the following activities:

- Locating and developing training materials,
- Reviewing training materials,
- Conducting training sessions,
- Reviewing evaluation data,
- Disseminating project information.

Appendix A contains a list of Project Advisory Council members.

Objective 2: Microcomputing Competencies

In 1986, Elizabeth McClellan Byrom (Project Director), A. Edward Blackhurst (University of Kentucky), and Charles MacArthur (University of Maryland) conducted a study designed to determine microcomputing competencies needed by teacher educators who train special education teachers. A 47 item questionnaire was mailed to 257 teacher educators identified by Blackhurst and MacArthur (1985) as being knowledgeable about microcomputer applications in special education and teacher preparation. 143 teacher educators responded to the questionnaire. The survey results served as a foundation for the content of RETOOL training materials and workshops. Dr. Blackhurst also used the resultant competencies list to develop a checklist that teacher educators can use as a self assessment of their microcomputing knowledge and skills.

Drs. Blackhurst and Byrom presented the results of the survey at the 1986 conference of the Teacher Education Division, which was held in Atlanta. Additionally, the survey results were published in a 1987 issue of Teacher Education and Special Education (Appendix B).

Objective 3: Training Materials

Over the course of the three year project, staff and consultants developed or adapted training notebooks on the following topics:

Year I

- Integrated Software for Teacher Educators: AppleWorks by A. Edward Blackhurst
- Integrated Software for Teacher Educators: Electric Desk by Elizabeth McClellan Byrom
- Authoring Systems (1st edition) by Joseph Lamos and Marion Panyan

Year II

- Special Education Technology in the Higher Education Curriculum by Elizabeth Byrom and RETOOL staff
- Telecommunications Applications in Special Education by Robert Gall, David Keefe, and Marcia Jenkins
- Expert Systems by Joesph Ferrara and Utah State University staff
- Authoring Systems (2nd edition) by Marion Panyan, A. Edward Blackhurst, Deborah Bott, and Gail Fitzgerald

Year III

- Hypermedia and Interactive Videodiscs by Ted S. Hasselbring, Laura Goin, and Ron Thorkildsen
- Microcomputer Technology for Persons with Physical Disabilities by Judy Rein, Pat Ourand, and Bud Rizer
- Using Microcomputers to Enhance Teacher Educators' Professional Productivity by A. Edward Blackhurst and Elizabeth Byrom

Year I

Integrated Software. The first two modules were designed to show teacher educators how to use word processing, databases, and spreadsheet programs in their teacher preparation programs. A. Edward Blackhurst developed a series of AppleWorks materials and templates with a wide range of practical applications, including student records, IEPs, banks of test questions, gradebooks, and budgets for federally funded projects. The Project Director converted these materials and templates into a second notebook for IBM PCs and compatibles.

Authoring Systems. The third notebook focused on the use of authoring systems and languages as tools for developing computer assisted instruction. Originally, this notebook had two components, a) the HELPmate authoring system created by Joseph Lamos, who was then at the Denver Research Institute, and b)

Multisensory Authoring Computer System (MACS), which was created by Marion Panyon and her colleagues at the Johns Hopkins University. The notebooks contained not only printed materials, but also the authoring systems software. During the second and third years of the project, this notebook was revised because a) newer and more powerful authoring software became popular with special educators, b) an expanded version of MACS was made available to the project, and c) the HELPmate system had to be replaced because it was developed on a computer operating system that has become virtually obsolete.

Year II

Technology in the Higher Education Curriculum. In July, 1987, Project RETOOL sponsored a round table on Special Education Technology in the Higher Education Curriculum, which was held at CEC Headquarters in Reston, Virginia. The purpose of the round table was to develop a list of recommendations for institutions of higher education that are planning to develop or modify pre-service training in special education technology. The resultant list became part of a notebook of information and materials (e.g., program descriptions, course syllabi, reference lists) from twenty-two colleges and universities throughout the nation. Of all the materials developed by the project, this has been the most in demand. This is in part because many personnel preparation programs that started offering technology training eight or nine years ago realize the need to revamp them, and partially because the materials are very useful for schools preparing folios for NCATE review. At last count, over 600 teacher educators have received copies of this notebook.

Telecommunications. In terms of numbers of copies, the training packet on telecommunications has a more limited audience than the notebook from the round table, but for educators in remote geographic areas, the need for training and materials in long distance education is acute. The RETOOL training packet contains various applications of telecommunications, including SpecialNet, student networks, statewide data collection, and a model for delivering special education personnel preparation courses to remote sites. The model was developed by Robert Gall, a telecommunications expert who spearheaded a mammoth long distance education program in Alberta.

Expert Systems. When looking at the gamut of materials developed by this project, one cannot help but realize the wide range of computer expertise of target audiences. For example, the notebooks on integrated software can be used by a relatively novice computer user; the materials on expert systems are meant for teacher educators who have the interest and technical expertise to develop expert systems. This notebook is an intellectually demanding collection of materials that reflect two different approaches to expert systems, one espoused by researchers at Utah State University and another used by compatriots at the University of Maryland. The reader may be

interested to know that two participants in the field test of the expert systems notebook have written grants that will lead to the development of two new expert systems for special educators.

Authoring Systems (revised). During Year II, the content of the authoring systems notebook was changed significantly. First, Deborah Bott provided a conceptual framework for the entire notebook by contributing materials on instructional design. Next, Johns Hopkins University staff contributed the revised edition of the MACS system, including the basic software program, graphics discs, and documentation. Finally, A. Edward Blackhurst added templates and printed materials on the SuperPILOT authoring language.

Year III

HyperCard and Interactive Videodiscs. Of all the new technologies that have appeared on the market in the last ten years, none has generated as much enthusiasm as hypermedia, (also referred to as multimedia). In essence, hypermedia software is a way of linking non-sequential pages of text with other media such as videodiscs, sound, CD-ROM, and videotape. Drs. Ted Hasselbring of Vanderbilt University and Ron Thorkildsen of Utah State University drew from their considerable research on hypermedia and videodiscs to contribute the basic content for the RETOOL notebook on this timely topic.

Adaptive and Assistive Devices. The Johns Hopkins University and the Maryland Rehabilitation Center in Baltimore have a collaborative arrangement through which individuals with physical or sensory disabilities are trained to use microprocessor-based adapative devices aimed at improving communication, mobility, and environmental control. The two major components of the program are a) evaluation of individuals' needs and b) training in how to use the devices. These components became the kernel of the Project RETOOL training manual on adaptive devices.

Using Microcomputers to Enhance Teacher Educators' Professional Productivity. Most of the training modules developed through this project focused on advanced technology applications; however, the Project Advisory Council indicated that the project needed to address the fact that there are still significant numbers of higher education faculty who have not developed the basic competencies necessary to use microcomputers as tools for professional productivity. The purpose of this training notebook was to provide the incentive and information necessary to develop these competencies.

Objectives 4, 5, and 6: Field Tests and Training

Over the three years of the project, twelve training events served a dual purpose: a) to field test the training materials and b) to disseminate the materials to teacher educators who want to incorporate them in their personnel preparation programs. Appendix C contains copies of the promotional materials which describe training events for each year. Training topics, dates, and sites were as follows:

AppleWorks for Teacher Educators - January, 1987
The University of Kentucky

Integrated Software for the IBM - March, 1987
IBM Training Center, Washington DC

Authoring Systems - April 1987,
The University of Illinois

Special Education Technology in the Higher Education Curriculum - July, 1987
CEC Headquarters, Reston, VA

Telecommunications & Long Distance Education - January, 1988
The University of Hawaii

Expert Systems - February, 1988
Utah State University

Authoring Systems (version 2) - May, 1988
Northern Arizona University

Microcomputer Technology for Persons with Physical Disabilities - September, 1988
The Maryland Rehabilitation Center and The Johns Hopkins University

Videodisc and HyperCard Applications in Special Education - October, 1988
Vanderbilt University

Authoring Systems - January, 1989
Long Island University

HyperCard - Knoxville, 1989
The University of Tennessee

Using Microcomputers to Enhance Teacher Educators' Professional Productivity - March, 1989
San Jose State University

Training sites. Selection of training sites was based on three main criteria: geographic distribution, research and teacher training being conducted at host universities (e.g.,

expert systems at Utah State; Hypermedia at Vanderbilt University), and cost effectiveness.

Training participants. The number of participants in training events ranged from 15 for the workshop on adaptive devices to 34 for the one on professional productivity. The demand for the first HyperCard workshop was so great and created such an extensive waiting list that a second workshop was held. Of the 244 participants, 75 Seventy-five percent indicated that they are teacher educators; 3.33 percent are researchers, 15.33 are administrators, and 6.67 fill "other" professional roles. As the figures in Appendix D show, RETOOL training participants come from all parts of the nation.

Objective 7: Dissemination

Promotion. Each year, project staff developed a flier that described the training activities (Appendix C). This promotional material was mailed to a) all of the chairs of departments of special education personnel preparation programs in the nation, b) the 2,400 members of CEC's Teacher Education Division, c) participants in previous RETOOL training events, and d) over 220 individuals who asked to be placed on the project's mailing list. Information about the project was also placed in TEACHING Exceptional Children and a variety of newsletters.

Presentations. The Project Director presented information about the project at a variety of conferences including the CEC conventions in Chicago and Washington DC, TED conferences in Atlanta and Alexandria, the Technology and Media division conference in Baltimore, and the IBM Seminar for Deans of Colleges of Education in Austin.

Distribution of Training Materials. As previously mentioned, the demand for the various notebooks varied greatly, depending on the topic addressed. Approximately 600 copies of the notebook resulting from the round table on special education technology in the higher education curriculum were mailed to teacher educators across the nation. Three hundred copies of the AppleWorks notebook and 100 copies of the authoring systems notebook were also distributed. All of the notebooks have been submitted to ERIC for inclusion in the database.

Objective 8: Evaluation

As can be seen from the evaluation data in Appendix E, RETOOL workshops were very valuable training experiences for teacher educators. These data and progress reports have been submitted to the Project Advisory Council, the TED Executive Committee, and CEC governance.

Objective 9: Project Management

All project activities were conducted on time and within budget. This efficiency resulted from careful planning, on-going communication among project staff, cooperation with consultants and trainers, and support from CEC staff. Because the project's fiscal year was different from CEC's fiscal year, RETOOL staff maintained an independent record of expenditures that was used to make comparisons with CEC's records. Although the dual system created a duplication of effort, it ensured an accurate accounting.

The Project Director submitted quarterly progress reports to the CEC Board of Governors, semi-annual reports to the TED Executive Committee, and semi-annual reports to the RETOOL Advisory Council. All of these groups were very supportive of the project's activities and products.

CONCLUSIONS

Toward the end of the project, staff conducted a survey of RETOOL "graduates" to determine the extent to which they are using their new knowledge and skills. Respondents indicated that 21.33 percent consider themselves beginning computer users, 46.67 are intermediate users, and 22 percent are at the advanced or cutting edge level. Sixty-three percent use computers daily; 22 percent use them at least several times a week. Considering the percentage of respondents who are teacher educators (75%), it is interesting to note that 71.33 percent of the total number of respondents say they use microcomputers in the courses they teach; thus, one could infer that the vast majority of the respondents are using information and training provided through the project.

In looking over evaluation comments expressed by the teacher educators who participate in RETOOL training events, three factors are evident: 1) the materials are useful in special education personnel preparation programs, 2) the opportunity to work with colleagues across the nation is essential to their growth as professionals, and 3) learning from experts in special education technology is a treasured experience. These factors are supported by statistics indicating the extent to which RETOOL participants use their own funds to attend workshops. Only 12.67 percent had all expenses covered. Eighteen percent received no support; 44.7 percent received minimal support; 16.67 received at least half; 5.33 percent received support from other sources.

A large part of the success of this and other RETOOL projects has been the strong commitment of teacher educators who serve as trainers and members of the Project Advisory Council. The level of support, enthusiasm, and commitment of the leaders in the field of special education technology could not be stronger.

The ultimate success of the project can be attributed to the staff of the U.S. Department of Education's Office of Special Education and Rehabilitation Services who not only provided funding but also contributed moral support and professional advice.

APPENDIX A

PROJECT ADVISORY COUNCIL

RETOOL Project Advisory Council

Alan Brightman
Apple Computer, Inc.

G. Phillip Cartwright
U. of California-Davis

David Keefe
IBM

Harold Heller
U. of North
Carolina-Charlotte

Linda Tsantis
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Linda O'Donnell
U. of Missouri-Kansas City

Marion Panyan
The Johns Hopkins University

Barbara Sirvis
State University College
at Buffalo

Janice Schnorr
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John McLaughlin
Virginia Tech

Richard Swanby
Trenton State College

Charles Horn
University of Alabama

Gary Snodgrass
SpecialNet

Ted S. Hasselbring
Peabody College of Vanderbilt
University

Charles Wooten
Florida Department of Education

Charles MacArthur
University of Maryland

Robert Gall
University of Lethbridge

A. Edward Blackhurst
University of Kentucky

Michael Behrmann
George Mason University

Robert Gilmore (ex-officio)
U.S. Department of Education

APPENDIX B

RESULTS OF MICROCOMPUTING COMPETENCIES SURVEY

Teacher Education and Special Education, 1987, 10(4), 153-160

ABSTRACT

A list of 43 microcomputing competencies associated with the functions that special education professors typically perform was generated through a task analysis. Approximately 60% of a national sample of 250 special education faculty who use microcomputers responded to a questionnaire designed to assess the value of the competency statements. Competencies associated with the function of providing instruction about microcomputer applications in special education were viewed as being most important, followed by those associated with using the microcomputer as an aid to instruction in courses and as an aid to personal productivity. With a few exceptions, competencies related to the use of microcomputers to meet service responsibilities, computer programming and related skills, and selection and operation of microcomputer equipment were seen as less useful. Word processing was rated as the single most useful competency and computer programming as the least useful.

Microcomputing Competencies for Special Education Professors

A. EDWARD BLACKHURST
CHARLES A. MacARTHUR
ELIZABETH McCLELLAN BYROM

Edward Blackhurst is Professor and Director of the Special Education Microcomputer Specialist Program, Department of Special Education, of the University of Kentucky at Lexington; Charles MacArthur is Associate Director of Leadership Training: Computer Technology in Special Education of the University of Maryland at College Park; and Elizabeth Byrom is Director of Project RETOOL, Council for Exceptional Children, at Reston, Virginia.

A national survey on the use of microcomputers in special education personnel preparation programs found that instruction in the use of microcomputers in special education is perceived to be important for special education teachers (Blackhurst & MacArthur, 1986). However, the survey found that many special education faculty lacked the skills necessary to provide that instruction. When microcomputers were being used, most faculty were using them to perform such functions as word processing, record keeping, statistical analysis, and test generation. Lack of faculty knowledge and skills were cited as barriers to increased use of microcomputers and instruction about their use in special education personnel preparation courses.

Institutions of higher education (IHEs) and national professional associations have initiated various projects aimed at increasing the number of special education faculty trained in microcomputer use. For example, the Teacher Education Division (TED) of the Council for Exceptional Children (CEC) operates Project RETOOL, which is designed to provide inservice training workshops on microcomputer use for special education faculty (Byrom, 1986). Intensive postdoctoral training on applications of microcomputer technology in special education is offered at the University of Kentucky (Blackhurst, 1986), and the University of Maryland offers a doctoral program

in microcomputing research to provide training to those who may become special education faculty members (MacArthur & Burke, 1986).

There continues to be a need, however, to identify specific areas in which special education faculty might require training in the use of microcomputers. To facilitate the assessment of training needs, it is first necessary to identify the competencies that special education faculty should have if they are to use microcomputers and teach about their applications. Once those competencies have been identified, it will be possible to conduct very specific training needs assessments, develop training programs in response to those needs, and evaluate the effectiveness of the training programs.

PURPOSE

The purposes of this research were to identify the microcomputing competencies important for special education faculty and then determine the perceived importance of each. The following research questions were addressed:

1. What microcomputing competencies should special education faculty members have?
2. What is the relative importance of the microcomputing competencies?
3. What microcomputing competencies represent specialty areas and should be of interest to only a few special education faculty?

IDENTIFICATION OF COMPETENCIES

An ERIC search was performed in an effort to identify research or descriptive articles relative to microcomputing competencies deemed important for special education faculty. The search yielded no literature on the topic. Consequently, the authors proceeded to conduct a task analysis in an effort to generate a list of competencies that would answer the first research question.

The frame of reference used to guide the task analysis focused on functions that special education faculty perform. The task analysis was predicated on three assumptions: (1) microcomputers are available at IHEs to support the functions; (2) microcomputers are important in the education of exceptional children; and (3) instruction about microcomputer use should be provided in special education personnel preparation programs. The national survey cited earlier supported those assumptions.

Six functions were identified as being relevant. Task analyses were then performed for each of the functions, yielding a total of 43 competencies. The competency list was submitted to a panel of judges for reaction. The judges were nine advanced graduate students enrolled in a course on research techniques in special education. All had masters degrees in special education and were pursuing either an educational specialist or doctoral degree with an emphasis on applications of microcomputers in special education. Each judge had completed four courses and a practicum in microcomputer applications in special education; all were enrolled in an additional three courses and a second practicum on that topic at the time they evaluated the competencies. Seven of the nine judges owned a personal computer; all nine used microcomputers. All judges were women.

The judges were asked to edit any items that were unclear and to add or delete items, with the goal of creating a comprehensive list of microcomputing competencies for special education faculty. Recommendations for change were incorporated into a revised competency list and resubmitted. Judges unanimously agreed that this final list of functions and competencies was appropriate.

The six functions and the corresponding 43 competencies that were identified appear in Table 1.

PROCEDURES FOR DETERMINING THE VALUE OF THE COMPETENCIES

Survey research was conducted to answer the research questions. Following are descriptions of the instrument developed to collect the data, the sample from which the data were collected, and the data analyses that were conducted.

Instrumentation

The instrument for this part of the investigation was a questionnaire based on the 43 identified competencies. Competency statements were arranged according to the six functions associated with the use of microcomputers by special education faculty and followed by rating categories denoted by the letters X, S, N, U, and E. Respondents were asked to judge the importance of each competency by circling one letter according to the following key:

X = Not sure about the importance of this competency
S = Specialty area; of interest to only a few faculty
N = Not useful
U = Useful
E = Extremely useful for improved productivity

TABLE 1

Microcomputer functions and competencies

Function 1: *Using a microcomputer as an aid to personal productivity*

1. Use a word processor to prepare class notes, manuscripts, and other written documents.
2. Use utilities, such as mail-merging programs and spelling checkers.
3. Use database programs to maintain records.
4. Use a microcomputer to maintain files of reference materials, annotations, and bibliographies to support research and writing.
5. Perform statistical analyses with microcomputer software.
6. Use graphics software to prepare charts and graphs for research manuscripts and presentations.
7. Using a spreadsheet program to manipulate budgets and fiscal records.
8. Using electronic message services, such as "SpecialNet."

Function 2: *Using the microcomputer as an aid to instruction in college courses*

9. Use microcomputer systems to prepare instructional materials, such as transparencies.
10. Use computer programs to support drill and practice, tutorial, simulation, and problem-solving activities in classes taught.
11. Store questions in computerized test banks and generate examinations.
12. Use gradebook software programs to store student grades.

Function 3: *Selecting and operating microcomputer equipment*

13. Conduct comparative analyses of microcomputer hardware and related equipment in order to make selection decisions.
14. Set up microcomputer equipment and test it to ensure that it will operate correctly.
15. Configure software to ensure that all of its features will work properly with the microcomputer equipment being used.
16. Install peripheral devices that enhance the capabilities of a microcomputer (e.g., modems, printers, extra memory, clock cards).
17. Use mass storage devices, such as hard disks.
18. Use simple diagnostics to determine problems and perform routine maintenance of microcomputer hardware and software.
19. Use system commands and utilities needed to load, run, save, and copy programs.

Function 4: *Providing instruction about microcomputer applications in special education*

20. Define terms and concepts related to microcomputer applications in special education.
21. Identify major issues associated with the use of microcomputers in special education.
22. Articulate goals and a philosophy for using micrcomputer technology in special education.
23. Describe research on microcomputer use in special education.
24. Teach ways to evaluate microcomputer software for its potential in teaching exceptional individuals.
25. Select and demonstrate software programs that are appropriate for use with exceptional children.
26. Teach how tool uses of microcomputers, such as word processing and databases, can be used with exceptional students.
27. Demonstrate commercial software programs designed to generate IEPs and analyze the results of educational or psychological assessments.
28. Show how to use adaptive devices for environmental control and how to make computers accessible to those with physical or sensory impairments.
29. Teach how to evaluate the effectiveness of microcomputer applications in special education.
30. Teach how to integrate microcomputer use into curricula for exceptional children.
31. Provide information about resources available to support the use of microcomputers in special education.
32. Explain ethical considerations related to uses of microcomputer technology in special education.

Function 5: *Using microcomputers to meet service responsibilities*

33. Conduct needs assessments related to the use of microcomputers in special education.
34. Consult with special education teachers about their use of microcomputers.
35. Provide inservice training about microcomputer use in special education.
36. Identify sources of funding for microcomputer hardware and software for special education programs.
37. Prepare proposals for the funding of special education microcomputer projects.

Function 6: *Computer programming and related skills*

38. Copy and run computer programs from program listings in books and computer magazines.
39. Design computer-assisted instruction programs that could be programmed by those who have programming skills.
40. Use pre-packaged software-authoring systems to prepare computer-assisted instruction lessons for students.
41. Use authoring languages (such as PILOT) to create computer-assisted instruction lessons for students.
42. Modify computer programs to make them more useful with special populations.
43. Write computer programs using high-level languages such as BASIC or Pascal.

Before the questionnaire was distributed, the judges were asked to respond to the questions on the questionnaire and answer several questions about its format and structure. Six of the nine judges stated that the response mode was appropriate; the remainder were unsure. Several editorial recommendations also were made. The instrument was finalized, incorporating the comments of the judges.

Sample

The questionnaire was sent to 250 people identified in previous research (Blackhurst & MacArthur, 1986) as special education faculty who were knowledgeable users of microcomputers. A total of 148 questionnaires were returned, for a response rate of 59.2%. Respondents were rather evenly distributed throughout the country, with questionnaires being received from people in 45 states. No single state had more than 9 respondents. Of this total, 37.8% were women and 60.8% were men. Two persons chose not to reveal their gender.

Determination of Rank Order

For each of the 43 competency statements included in the questionnaire, the percentage of respondents circling each of the five rating choices was computed. To determine the rank of each microcomputer function in terms of importance to faculty, the "useful" and "extremely useful" percentages for the specific competencies associated with the function were combined and averaged. The function with the highest combined average percentage was ranked first in importance; the function with the next highest percentage was ranked second; and so on. The combined "useful" and "extremely useful" percentage scores of specific competencies also were used to rank order the competency statements within their respective microcomputer function categories.

RESULTS AND DISCUSSION

Table 2 presents a rank-ordering of the six functions and their associated competencies. The bold statements represent the six functions. The other statements are abbreviated versions of the 43 competencies listed in Table 1. Table 2 also displays the percentage of responses to each of the five response categories (i.e., unsure, specialty area, not useful, useful, extremely useful) for the 43 competencies. The percentages to the right of the six function statements are averages of the percentages for the specific competency associated with and listed below each function.

An examination of the "unsure" rating category in Table 2 suggests that respondents were confident in their judgments about the competencies. Overall, only 5.2% of all ratings fell into the "unsure" category. Respondents appeared to be the most unsure about the importance of competencies associated with the function of selecting and operating microcomputer equipment.

The relatively few respondents who rated a particular competency as "not useful" indicates that most of the competencies were perceived as having value. Not all competencies, however, were perceived as being important for all faculty. Approximately one-third of the respondents perceived competencies associated with microcomputer selection and operation, computer programming, and professional service as being specialty areas that were of interest to only a few faculty.

The competency perceived as being least useful (17.6% combined "useful" and "extremely useful" score) was the ability to write computer programs using high-level languages such as BASIC or Pascal. The competency judged most useful (94.6% usefulness score) was the ability to use a word processor to prepare class notes, manuscripts, and other written documents.

The six microcomputer functions were found to rank in their usefulness to special education faculty as follows:

1. Providing instruction about microcomputer applications (85.1%)
2. Using the microcomputer as an aid to instruction in courses (80.3%)
3. Using a microcomputer as an aid to personal productivity (73.1%)
4. Using microcomputers to meet service responsibilities (61.4%)
5. Computer programming and related skills (49.2%)
6. Selection and operation of microcomputer equipment (47.6%)

These functions and associated competencies are discussed below.

Instruction about Microcomputers

As a category, competencies associated with providing instruction about microcomputer applications in special education were considered to be the most important. With one exception, all of the competencies associated with this function were rated as useful or extremely useful by more than 80% of respondents. The two competencies seen as most critical in this area were teaching how to integrate microcomputer use into curricula for exceptional

TABLE 2

Rank order of usefulness of the six functions and competencies within each function (N = 148)

Competency	Unsure	Specialty Area	Not Useful	Useful	Extremely Useful
Instruction about Microcomputers	1.9%	9.7%	2.6%	39.9%	45.2%
30. Integrate micro in curriculum	0.7	4.7	1.4	35.8	57.4
25. Demonstrate software	0.7	5.4	1.4	28.4	64.2
31. Resources to support micro use	2.0	6.8	0.7	48.0	42.6
24. Evaluate software	2.7	6.8	2.0	28.4	60.1
20. Define terms & concepts	2.7	6.8	2.7	48.0	39.9
22. Articulate philosophy for use	2.0	8.8	2.0	50.0	37.2
26. Teach about micros as tools	2.0	8.1	2.7	32.4	54.7
21. Identify issues in use	1.4	8.8	2.0	37.8	50.0
29. Evaluate micro effectiveness	1.4	10.8	3.4	41.9	42.6
27. Use IEP & assessment software	2.0	13.5	3.4	43.9	37.2
32. Explain ethical considerations	4.1	8.8	6.8	44.6	35.8
23. Describe microcomputer research	1.4	14.2	3.4	51.4	29.1
28. Use adaptive devices	2.0	30.4	2.0	28.4	37.2
Teaching Aid	4.9	9.0	5.9	51.9	28.4
11. Test generation	1.4	7.4	1.4	46.6	43.2
9. Prepare instructional aids	9.5	8.1	2.7	53.4	26.4
12. Student gradebook programs	4.1	7.4	10.1	56.8	21.6
10. Computer-assisted instruction	4.7	12.8	9.5	50.7	22.3
Personal Productivity	4.8	18.3	3.6	42.7	30.4
1. Use a word processor	1.4	2.7	1.4	19.6	75.0
4. Maintain reference files	2.0	10.1	2.0	44.6	41.2
3. Use database programs	1.4	10.1	2.7	57.4	28.4
2. Use utility programs	8.1	12.2	6.1	52.7	20.3
5. Perform statistical analyses	2.7	24.3	2.0	41.2	29.7
6. Prepare graphs and charts	5.4	21.6	2.7	50.0	20.3
8. Use telecommunications	12.2	23.0	6.1	45.3	13.5
7. Use spreadsheets	5.4	42.6	6.1	31.1	14.9
Professional Service Aid	2.8	32.4	3.4	37.3	24.1
35. Provide inservice	1.4	26.4	2.7	37.2	32.4
34. Consult about micro use	4.7	23.0	4.1	45.3	23.0
36. Identify sources of funding	2.0	33.1	2.7	35.1	27.0
33. Conduct micro needs assessment	4.1	39.2	2.7	40.5	13.5
37. Prepare micro proposals	2.0	40.5	4.7	28.4	24.3
Microcomputer Selection/Operation	10.1	32.0	10.0	30.1	17.5
19. Use system commands	2.0	5.4	2.0	35.8	54.7
14. Set up and test equipment	12.2	32.4	11.5	29.1	14.9
13. Make selection decisions	11.5	36.5	7.4	30.4	13.5
18. Diagnose & maintain systems	9.5	34.5	14.2	33.1	8.8
16. Install peripheral devices	10.1	41.2	10.1	27.7	10.8
15. Install software	12.8	37.2	12.2	25.0	12.8
17. Use hard disks	12.8	37.2	12.8	29.7	6.8
Computer Programming	6.6	35.2	8.8	32.5	16.7
40. Use authoring systems	1.4	15.5	3.4	47.3	32.4
41. Use authoring languages	4.1	30.4	6.8	39.2	19.6
42. Modify existing programs	2.7	37.8	6.1	34.5	18.9
38. Copy programs from magazines	12.2	30.4	11.5	33.8	11.5
39. Design CAI programs	6.1	48.6	4.7	23.6	16.9
43. Write computer programs	13.5	48.6	20.3	16.9	0.7
Overall Percentage	5.2	22.8	5.7	39.1	27.0

Notes: Rank order determined by summing last two columns. Some percentages do not total 100 due to rounding errors. Competency numbers correspond to the complete competency statements listed in Table 1.

children and being able to select and demonstrate software programs appropriate for exceptional children.

The national survey discussed earlier (Blackhurst & MacArthur, 1986) found that two of the top three microcomputer training needs for special education

faculty involved special education applications with hardware and software. This study verifies the importance of these topics, respondents strongly indicating that special education faculty should incorporate into their courses information about ways microcomputers can be used in the delivery of instruction to exceptional children. Yet faculty may be ill-equipped to provide such instruction. Additional research to identify microcomputer training needs of faculty should be performed to verify the validity of this assertion.

Teaching Aid

For the function rank ordered second in importance—the use of the microcomputer as an aid in teaching special education courses—the competency of using test banks was viewed as the most important. The use of utility programs that permit the preparation of instructional aids and storage of student grades also was considered important by the vast majority (80%) of the respondents. Respondents were less sure of the importance of computer-assisted instruction for college courses, 13% viewing this as a specialty area for a few faculty.

Personal Productivity

Of the competencies associated with the third-ranking microcomputer function—use of the microcomputer as an aid to personal productivity—the ability to use a word processor topped all others in importance. Of the remaining competencies associated with this function, most respondents considered using utility programs such as spelling checkers (74%), using database programs (86%), and using microcomputers to maintain reference files (86%) useful or extremely useful.

Approximately 25% of the respondents viewed the use of the microcomputer for statistical analysis and preparation of graphics for research articles as specialty skills of interest to only a few faculty. Perhaps those who responded in this fashion represented IHEs that did not require faculty to conduct research. An alternative explanation might be that mainframe computers are viewed as being more appropriate tools than microcomputers for performing statistical analyses and preparing graphic displays of data.

Using spreadsheets was also viewed as a specialty area by nearly 43% of the respondents. In all likelihood, many of the respondents view fiscal management as being primarily in the domain of administrators. Faculty who are not required to maintain fiscal records would not be expected to know how to use an electronic spreadsheet to maintain these records.

Professional Service Aid

Overall, the competencies associated with the fourth ranking microcomputer function of meeting service responsibilities were considered useful (37.3%) or extremely useful (24.1%) by the majority of respondents (61.4%). Nevertheless, a large proportion of respondents (32.4%) considered this area to be a specialty area. It should be emphasized that the competencies associated with service were worded in such a way that services to be performed were directly associated with microcomputer use (e.g., providing inservice training training about microcomputers, conducting needs assessment about about microcomputer use). It is likely that only some faculty would be interested in providing such specialized services. However, if competencies were worded to emphasize the use of microcomputers to facilitate professional services, regardless of the topic of the service, a broader range of faculty might consider these competencies to be highly useful.

Microcomputer Selection/Operation

Of the seven competencies associated with the fifth ranked function—the selection and operation of microcomputer equipment—the ability to use system commands and utilities was the only competency seen as useful or very useful by the majority (90.5%) of respondents. In the authors' experience, there are generally one or two people in a special education department who are interested in microcomputer hardware. These "computer gurus" are the ones who are called upon to install hardware, learn how to operate new equipment, and troubleshoot when something goes amiss in the operation of either hardware or software. In all likelihood, this is the case at other IHEs. If so, it would account for the findings associated with this function.

Computer Programming

Nearly half (49.2%) of the respondents considered the area of programming, the lowest ranking area, as one in which some faculty should specialize. Yet more than one-third (35.2%) of the respondents viewed competencies associated with computer programming and specialty skills to be of interest to only a few faculty. For example, the design of computer-assisted instruction (CAI) programs was seen as a specialty skill (48.6%), yet a useful or highly useful (40.5%) one. Only 4.7% considered this skill of no value.

Of the competencies associated with computer programming, respondents rated the ability to use prepackaged software-authoring systems to prepare computer-assisted instruction lessons for students

as most important. Nearly 80% rated this competency as useful or extremely useful. The ability to write computer programs was viewed as the least useful competency, with only 17.6% considering it useful or extremely useful to faculty.

CONCLUSIONS AND IMPLICATIONS

This research generated a list of microcomputing competencies associated with the functions that special education professors typically perform at institutions of higher education. A panel of judges confirmed the face validity of the competencies and questionnaire respondents made judgements about the relative value of each competency statement. Although competencies associated with the use of the microcomputer as an aid to personal productivity and in teaching courses were viewed as useful, the most important competencies were those associated with the function of providing instruction about microcomputer applications in special education programs. When ratings of useful and extremely useful were combined, the competencies associated with this function can be ranked in the following order of importance. The statements complete the declarative stem: *Special education faculty should be able to . . .*

- teach how to integrate microcomputer use into curricula for exceptional children.
- select and demonstrate software programs that are appropriate for use with exceptional children.
- provide information about resources available to support the use of microcomputers in special education.
- teach ways to evaluate microcomputer software for its potential in teaching exceptional individuals.
- define terms and concepts related to microcomputer applications in special education.
- identify major issues associated with the use of microcomputers in special education.
- articulate goals and a philosophy for using microcomputer technology in special education.
- teach how tool uses of microcomputers, such as word processing and databases, can be used with exceptional students.
- teach how to evaluate the effectiveness of microcomputer applications in special education.
- demonstrate commercial software programs designed to generate IEPs and analyze the results of educational or psychological assessments.
- describe research on microcomputer use in special education.
- explain ethical considerations related to uses of microcomputer technology in special education.
- show how to use adaptive devices for environmental control and how to make computers accessible to those with physical or sensory impairments.

With the exception of the last of these competencies, which respondents saw as an area of primary interest to specialists, more than 80% of respondents considered these competencies useful or extremely useful. Clearly, these competencies need to relate to a faculty member's specific area of specialization. That is, faculty specializing in the area of the severely handicapped would be expected to be able to teach about ways that microcomputers should be integrated into the curriculum for students with severe handicaps, but not for students with mild learning disabilities.

If there is validity to the findings of this research, it has several implications. The first is that faculty need to assess their ability to perform these competencies. The competency list described here could be used for this purpose. A self-assessment instrument could be constructed that would enable faculty members to identify those competencies in which they already are competent, those that they have no interest in developing, those for which they are interested in developing an awareness, and those for which they are interested in developing skills.

Once that self-assessment is completed, faculty could then pursue a professional development program to acquire the competencies identified as being important. Departmental administrators could use similar procedures to develop a department-wide, inservice training program. Federal decision makers also could use data collected this way to plan funding priorities that support the development of faculty retraining programs.

Finally, a caveat should be noted. As Shores, Cegelka, and Nelson (1973) correctly pointed out, the validity of competency lists developed with procedures such as those described in this research is subject to question until the competencies have been verified empirically. In responding to the concerns of Shores and his colleagues, Blackhurst (1977) has argued that one of the principles of competency-based approaches to instruction is to specify competencies so they can be placed under public scrutiny. In this way, other professionals may examine them, debate their merits, and conduct the research that is necessary to either verify or refute their validity. The research described here is a first step to defining microcomputer competencies that special educational faculty should have. The valida-

tion of the competencies must remain the topic of future research efforts.

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APPENDIX C

PROMOTIONAL MATERIALS

PROJECT RETOOL

TRAINING IN SPECIAL EDUCATION TECHNOLOGY
FOR POST-DOCTORAL LEADERSHIP PERSONNEL

Project RETOOL is a federally funded project that offers higher education faculty opportunities to gain hands-on experience with microcomputer applications in special education. The project is operated by The Council for Exceptional Children and its Teacher Education Division. For the 1986-87 academic year, project staff and consultants have planned workshops on the following topics: AppleWorks, Integrated Software for the IBM, and Authoring Systems.

Workshop 1: **Appleworks**

University of Kentucky, Lexington
January 5-9, 1987

Professor A. Edward Blackhurst has designed a series of training activities and materials that show teacher educators how to use the word processor, database management, and spreadsheet programs of the AppleWorks system. In this workshop, Dr. Blackhurst will help participants use AppleWorks to develop a number of practical products, including the following:

- a bank of test questions for a course
- templates for student program plans
- a database template for maintaining student information
- a budget format suitable for grant proposals.

Training activities for the first three days will focus on word processing, database management, telecommunications, spelling checkers, and mailmerge programs. During the final two days, participants will learn about spreadsheets (budgets and gradebooks), hard-disk management, ASCII files, microcomputer troubleshooting, and disk repair. Participants will have the option of attending the workshop for three or five days.

Workshop 2: **Integrated Software for the IBM**

IBM Customer Service Center, Rosslyn, Virginia
March 4-6, 1987

Project staff are working with David Keefe and Linda Tsantis from IBM to plan a workshop that will introduce teacher educators to practical applications of integrated software. Participants will use Electric Desk, a software package similar to AppleWorks, to develop a bank of test questions, and templates for letters, student records, grades, program plans, and budgets. Participants will also have an opportunity to preview other IBM compatible software, e.g., Framework, Lotus 1-2-3, WordStar.

Workshop 3: **Authoring Systems**

University of Illinois, Champaign-Urbana
April 16-18, 1987

Authoring systems allow teachers with little or no computer programming experience to develop individualized computer assisted instruction lessons. In this workshop, participants will learn to use one of three authoring systems that were designed specifically for special education applications. Each system has unique features including graphics capabilities, screen editors, and auxiliary input/output devices. The researchers who developed the authoring systems will conduct the workshop.

Training activities will begin with an introduction to the principles of instructional design that are particularly relevant to the development of computer assisted instruction. Participants will then learn one of the following systems:

- The SPE. ED Authoring System, developed by Robert Zuckerman and colleagues at Kent State University. Training will be on the IBM version of the system.

- The H.E.L.P. Authoring System, developed by Joseph Lamos and colleagues at the Denver Research Institute. Training will be on the IBM version of the system.

- Multisensory Authoring Computer Systems (MACS), developed by Marion Panyan and colleagues at The Johns Hopkins University. Training will be on Apple computers.

There is no registration fee for any of the workshops, but participants will cover their costs for transportation, lodging, and food. The project has arranged special hotel rates ranging from $35-$45 per night in Lexington and Champaign to approximately $85 per night in Rosslyn.

If you would like to participate in one of the workshops, please fill in the application form and send it to:

Dr. Elizabeth McClellan
Director, Project RETOOL
The Council for Exceptional Children
1920 Association Drive
Reston, VA 22091

Space is limited, so applications are accepted on a first come, first served basis. After your application has been processed, project staff will send you more specific information on the content of the workshop you have selected. If you have any questions, please contact Elizabeth McClellan or Gale O'Brien at (703) 620-3660.

PROJECT RETOOL

TRAINING IN SPECIAL EDUCATION TECHNOLOGY
FOR POST-DOCTORAL LEADERSHIP PERSONNEL

Name _____

Address _____

City _____ State _____ Zip _____

Telephone (____)_____ SpecialNet Name _____

Academic Position _____

I would like to attend the following workshop (check one):

AppleWorks, University of Kentucky, January 5-9 _____
January 5-7 _____

IBM Integrated Software, Rosslyn, Virginia, March 4-6 _____

Authoring Systems, University of Illinois, April 16-18 _____

The following information will help workshop leaders plan training activities that meet different instructional needs.

What is your current level of computer experience?
Novice _____ Intermediate _____ Advanced _____

To what microcomputer model(s) do you have access (e.g., IBM PC, Apple II+)? _____

What model(s) do you use on a regular basis? _____
_____

What software, if any, are you currently using to facilitate professional productivity? Please specify.

Word Processing _____
Database Management _____
Spreadsheet _____
Graphics _____
Telecommunications _____
Authoring _____
Other _____

Are you currently using microcomputers in the classes you teach? If so, how are they being used? _____
_____
_____
_____
_____
_____

PROJECT RETOOL

Training in Special Education Technology For Post-Doctoral Leadership Personnel

Project RETOOL is a federally funded training project that offers higher education faculty opportunities to gain hands-on experience with microcomputer applications in special education. The project is operated by the Teacher Education Division of The Council for Exceptional Children. For the 1987-1988 academic year, project staff and consultants have planned training events on the following topics: Special Education Technology in the Higher Education Curriculum, Telecommunications, Expert Systems, and Authoring Systems.

No registration fees are required for RETOOL training events. If you would like to participate in a workshop, please complete the registration form and return it to: Project RETOOL, The Council for Exceptional Children, 1920 Association Drive, Reston, VA 22091, (703) 620-3660. Upon receipt of your registration, project staff will provide you with information concerning transportation, lodging, and schedule.

SPECIAL EDUCATION TECHNOLOGY IN THE HIGHER EDUCATION CURRICULUM

CEC Headquarters
Reston, Virginia
July 16-17

This roundtable will be a forum for teacher educators to share ideas and experiences regarding effective ways of integrating technology training into the higher education curriculum. Representatives of small, medium, and large colleges will lead the discussion by presenting descriptions of their training programs and by sharing materials on course offerings, course syllabi, lists of texts and training materials. Discussion leaders include the following teacher educators:

Ed Blackhurst—University of Kentucky
Ted Hasselbring—Vanderbilt University
Linda O'Donnell—University of Missouri, Kansas City
Barbara Reeves—Ohio University
David Slade—Johnson State College (Vermont)
Jim Skouge—California State University, Bakersfield

RETOOL staff anticipate several products will result from the roundtable: a compilation of technology program descriptions, course syllabi, lists of materials and texts, etc.; a prototype of training materials that teacher educators can use to infuse technology training into non-technology courses; and a list of recommendations that will help colleges and universities plan training programs in the future.

TELECOMMUNICATIONS

East—West Center
University of Hawaii (Honolulu)
January 7-9

Participants in this workshop will discover a wide range of technology applications for special education students, teachers, and teacher educators. Workshop topics include demonstrations of the following projects and activities:

Hawaii Kids, a telecommunications network for special education students—Demonstration by Marcia Jenkins, Hawaii State Department of Special Education

Special Talk, a network for special education teachers located throughout the country—Demonstration by David Keefe, IBM Special Education Program Department

Bibliographic Retrieval Service (BRS), an on-line collection of databases, including ERIC and ECER—Demonstration of how to conduct a search, Elizabeth Byrom, RETOOL project director

American Council on Rural Education (ACRES), using teleconferencing to train special education teachers in remote areas—Demonstration by Doris Helge, University of Western Washington

Hawaii Interactive Television System (HITS), using interactive television for extension courses, job training, and teleconferencing—Presentation (and hopefully demonstration) by Curtis Ho, University of Hawaii, Manoa

Project staff have made arrangements for group airfares and hotel rates, with options for four or seven day stays. Sample round trip fares on United Airlines: from Washington, DC, $598; from the Midwest, $578; from Seattle, $378. Sample hotel rates are $189 per person for four nights and $299 for seven nights. Transportation will be provided between the hotel and the East-West Center on the University of Hawaii campus.

NOTE: The CEC-MR annual conference will be in Honolulu, January 11-13. For information on the program, contact Tom Smith, 509 Forest, Fayetteville, Arkansas 72701 (501) 575-3548.

EXPERT SYSTEMS

Utah State University (Logan)
February 11-13

The goal of the workshop is to introduce teacher educators to expert systems, a practical application of artificial intelligence. Joe Ferrara (Utah State University) and Jackie Haynes (University of Maryland), who have developed expert systems for special education, will conduct the workshop. Presenters and participants will address the following questions:

- What is an expert system? How is it different from a regular computer program?
- What is artificial intelligence ? How do expert systems fit into the AI picture?
- How does an expert system work?
- How are expert systems currently being used in special education?
- What problems in special education can expert systems help solve?
- What is the future of expert systems?

Participants can stay at the University Inn for $28 for a single and $32 for a double.

AUTHORING SYSTEMS

Northern Arizona University (Flagstaff)
May 18-20

Authoring systems are computer programs that enable educators with little or no knowledge of computer programming to prepare instructional lessons. Participants in this workshop will learn one of three authoring systems developed specifically for special education.

Multisensory Authoring Computer System (MACS). Marion Panyan will demonstrate the MACS system, which comprises authoring and lesson programs, two graphics/speech disks, and an instructional manual. MACS helps educators create and edit 12 classes of lessons in which elementary age students with learning disabilities, mental retardation, or multiple handicaps learn to master concepts and information through a matching/discrimination paradigm. The system provides student performance data in summary graphs or item by item analysis. Participants in the MACS session will also enjoy a presentation by Ed Blackhurst in which he demonstrates ways of using Super Pilot to develop course materials.

HELPmate Authoring and Instructional Delivery System. Joseph Lamos will present his authoring system which helps educators develop instructional modules. At the micro level of authoring, teachers develop computer assisted instructional modules that are stored on computer diskettes to form courseware libraries. At the macro level, teachers create libraries of computer-based lessons, using the libraries of instructional modules created at the micro level. The HELPmate system has features for voice synthesis, large text, color highlighting, non-keyboard input, and sophisticated answer judging routines.

The SPE.ED Authoring System. Bob Zuckerman designed this system with the view that instruction involves many small discretely identifiable actions/interactions. Several unique capabilities of the system include (1) scan modes for moving about the frame of a lesson, (2) alteration of the sequence of frame presentations, (3) overlay windows which can provide hints or prompts, and (4) pretests which allow the developer to establish criteria for student placement within the courseware.

The MACS and Super Pilot programs run on Apple Computers. HELPmate and SPE.ED run on MS/DOS (IBM PC and compatibles). Applicants for this workshop must indicate in advance their choice of system. Each participant will receive a free copy of MACS, HELPmate, or SPE.ED.

In addition to instruction on the authoring systems, participants will learn some of the important principals of instructional design that apply to the development of computer based instruction. Deborah Bott will be the instructor for this workshop session.

NOTE: Jan Schnorr, our workshop hostess, has offered to lead an overnight hike into the Grand Canyon *after* the workshop. The trip will require a three day extension of your trip—one extra night in Flagstaff, and two in the Canyon (in cabins). Prices are very reasonable. If you are interested, please contact project staff right away.

Project RETOOL:

Training in Advanced Technology Applications for Post-Doctoral Leadership Personnel

WORKSHOP REGISTRATION

The Council for Exceptional Children
1920 Association Drive
Reston, VA 22091

Name _____

Academic Position _____

College or University Address _____

City _____ State ___ Zip _____ Telephone _____ Special Net Name _____

I would like to attend the following workshops

- ☐ SPECIAL EDUCATION TECHNOLOGY IN THE HIGHER EDUCATION CURRICULUM, CEC Headquarters July 16-17
- ☐ TELECOMMUNICATIONS, University of Hawaii January 7-9
- ☐ EXPERT SYSTEMS, Utah State University February 11-13
- ☐ AUTHORING SYSTEMS, Northern Arizona University May 18-20

There is no registration fee for Project RETOOL training, but participants cover their own travel costs and per diem. Participants who complete a workshop will receive a certificate.

The following information will help project staff plan the workshops:

What is your current level of computer experience?

Novice ____ Intermediate ____ Advanced ____

What microcomputer system do you use most frequently?

How many students are enrolled in your special education program?

Undergraduate ____ Graduate ____ In-service ____

How many special educators receive training in technology?

Undergraduate ____ Graduate ____ In-service ____

To what extent are you involved in training special administrators to use technology?

Have you or your colleagues developed training materials in special education technology? If so, briefly describe them on a separate sheet of paper. Indicate whether you are willing to share the materials with other teacher educators.

PROJECT RETOOL

Training in Advanced Technology Applications For Post-Doctoral Leadership Personnel

Project RETOOL is a training project that offers higher education faculty opportunities to gain hands-on experience with microcomputer applications in special education. The project is operated by the Teacher Education Division of The Council for Exceptional Children and is funded by the U.S. Department of Education's Office of Special Education and Rehabilitative Services.

For the 1988-1989 academic year, project staff and consultants have planned training events on the following topics: Microcomputer Technology for Persons with Physical Disabilities, Videodisc and HyperCard Applications in Special Education, Authoring Systems, and Using Microcomputers to Enhance Professional Productivity.

If you would like to participate in one of the workshops described on the following pages, please complete the registration form and return it to:

Dr. Elizabeth Byrom
Director of Special Projects
The Council for Exceptional Children
1920 Association Drive
Reston, VA 22091

Upon receipt of your registration form, project staff will send you information about transportation, lodging, and schedule.

No registration fees are required for RETOOL training events, but participants cover their own travel costs and per diem. Registration is generally limited to 20 participants per workshop, and applications are processed on a first come, first served basis. If you register for a workshop and later discover that you are unable to attend, please notify project staff right away so another teacher educator can participate.

Microcomputer Technology for Persons with Physical Disabilities

Center for Technology in Human Disabilities
Maryland Rehabilitation Center and The Johns Hopkins University, Baltimore
September 15-16, 1988

Hardware, peripherals and interfacing devices for individuals with physical disabilities are the focus of this workshop. Center staff members Judy Rein, Bud Rizer, and Pat Ourand have planned training activities aimed at helping participants meet the following objectives:

- ❑ Identify categories of adaptive devices that perform similar functions.
- ❑ Organize adaptive devices according to their effectiveness.
- ❑ Program adaptive devices to perform custom modifications specific to an individual user.
- ❑ Combine adaptive input and output technologies.
- ❑ Use software methods of enhancing work rate and accuracy of work completed by a person with a severe physical disability.
- ❑ Identify off-the-shelf software that can be used with adaptive hardware to further customize applications.
- ❑ Understand the language and components of the total interfacing process with persons with severe physical disabilities.
- ❑ Evaluate an individual's physical capabilities for potential applications of adaptive microcomputer technology.
- ❑ Understand the major function of the interface device, the device controller, and the output device.

Videodisc and Hypercard Applications in Special Education

Peabody College of Vanderbilt University, Nashville, Tennessee
October 6-8, 1988

This workshop is designed to introduce teacher educators to two cutting edge technologies, videodiscs and HyperCard and to explore their instructional applications. Ted Hasselbring (Vanderbilt University) and Ron Thorkildsen (Utah State University) will lead this jam packed training event that will address the following topics:

I. Introduction—Levels I, II, and III
   - A. Videodisc technology: Characteristics and capacities
   - B. Advantages, disadvantages, and typical applications

II. Videodisc Design Considerations
   - A. Incorporating research on effective teaching and instructional design
   - B. Effective teaching strategies in Level I videodiscs

III. Videodisc Programming—Level II
   - A. Designing Level II videodiscs
   - B. Writing Level II programs

IV. Videodisc Programming—Level III
   - A. Interfacing microcomputers to videodisc players
   - B. Controlling videodiscs using microcomputers

V. HyperCard, Videodisc, and Anchored Instruction
   - A. Theory and rationale of Anchored Instruction
   - B. Introduction to HyperCard
   - C. Using HyperCard and videodisc to develop Anchored Instruction
   - D. Repurposing videodiscs for education

Authoring Systems

Long Island University
January 11-13, 1989

Authoring systems are computer programs that enable educators with little or no knowledge of computer programming to prepare instructional lessons or modules. The goals of this workshop are a) to introduce teacher educators to the basic concepts underlying the development of computer assisted instruction, b) demonstrate several off-the-shelf, easy-to-use authoring shells, and c) provide hands-on experience using an authoring language to develop a computer assisted instructional lesson.

On the first day of the workshop, Deborah Bott (University of Kentucky) will introduce participants to some of the important principals of instructional design that apply to the development of computer based instruction. Marion Panyan (The Johns Hopkins University) will then demonstrate several authoring shells, i.e., computer programs that help educators create instructional games and other materials without having to write a computer program.

The second day's activities will focus on the Multisensory Authoring Computer System (MACS), which comprises authoring and lesson programs. graphics/speech disks, and an instructional manual. Dr. Panyan will demonstrate this system which helps educators create and edit 12 classes of lessons that assist elementary age students with learning disabilities, mental retardation, or multiple handicaps in learning to master concepts and information through a matching/discrimination paradigm. The system provides student performance data in summary graphs or item by item analysis. Workshop participants will receive a gratuitous copy of the MACS software.

On the third day, participants will enjoy a hands-on computer experience using Super Pilot. Edward Blackhurst will demonstrate several sets of materials that he uses in his classes at the University of Kentucky, and he will help participants use this authoring language to develop their own course materials.

Using Microcomputers to Enhance Teacher Educators' Professional Productivity

San Jose State University
March 29-31, 1989
(The CEC Convention is in San Francisco April 3-7)

In this workshop, A. Edward Blackhurst (University of Kentucky) and Elizabeth Byrom (CEC, Reston) will show teacher educators some ways microcomputers can facilitate the many professional activities expected of today's higher education faculty. Workshop presenters and participants will examine a variety of software packages designed to help professionals with the following tasks:

- ❑ Collecting, analyzing, and reporting research data
- ❑ Writing for publication
- ❑ Preparing presentations
- ❑ Writing proposals for grants and contracts
- ❑ Using technology as a teaching aid

The selection of software for this workshop will depend in part on the type of equipment available to the participants on a regular basis. Be sure to provide this information on the registration form.

Project RETOOL:

Training in Advanced Technology Applications for Post-Doctoral Leadership Personnel

WORKSHOP REGISTRATION

The Council for Exceptional Children
1920 Association Drive
Reston, VA 22091-1589
(703) 620-3660 FAX: (703) 264-9494

Name _____

Academic Position _____

College or University Address _____

City _____ State _____ Zip _____ SpecialNet ID _____

I would like to attend the following workshops:

- ☐ Microcomputer Technology for Persons with Physical Disabilities
- ☐ Videodisc and HyperCard Applications in Special Education
- ☐ Authoring Systems
- ☐ Using Microcomputers to Enhance Teacher Educators' Professional Productivity

The following information will help project staff plan the workshops:

What is your current level of computer experience?

Novice _____ Intermediate _____ Advanced _____

What microcomputer system do you use most frequently?

Apple II family _____ IBM/compatibles _____ Macintosh _____ Other _____

What equipment does your department have available for you and your colleagues to use? Check all that apply.

Apple II family	_____	Laptop	_____	IBM/compatible	_____
Adaptive devices	_____	Macintosh	_____	Videodisc player	_____
Mainframe	_____	No equipment	_____		

To what extent are you involved in training special educators to use technology?

APPENDIX D

GEOGRAPHIC DISTRIBUTION OF TRAINING PARTICIPANTS

GEOGRAPHIC DISTRIBUTION OF TRAINING PARTICIPANTS

	TOTAL	HI	NY	KNO	CA	MD	AZ	UT	NAS	DC	IL	KY
Alaska	1											1
Alabama	4				1		1		1			1
Arkansas	5		1	1	2						1	1
Arizona	2						2					
California	8	1			5		1			1		
Canada	3	1					2					
Colorado	6	2					2	1			1	
Connecticut	4		2		1			1				
Washington, DC	6					1				4	1	
Florida	2			1					1			
Georgia	4		2						2			
Hawaii	5	2			1		1		1			
Iowa	1										1	
Idaho	1							1				
Illinois	8		1						1		5	1
Indiana	3	1							1			1
Kansas	5						1		2	1		1
Kentucky	21	1		8		1	2	2	2		3	2
Louisiana	6	1			2	2			1			
Massachusetts	3		1		1						1	
Maryland	12	1	1			4	1	2	1	1		1
Michigan	3			1	2							
Minnesota	4							2	1		1	
Missouri	1						1					
North Carolina	3						1	1		1		
New Jersey	9	1	1		2		2	1	1	1		
New Mexico	1							1				
New York	14	1	4		2	4			1	1	1	
Ohio	7	2			1			1				3
Oklahoma	1				1							
Pennsylvania	11	1	3			2	1	2		1		1
Tennessee	26		1	13			1	2	6		2	1
Texas	4	1			1		2					
Utah	14	1						12	1			
Virginia	15	2	2	1		2	1	3		2	1	1
Vermont	2								1			1
Washington	2	2										
Wisconsin	4				1				1	1	1	
West Virginia	12		2	1	1	1	2		3		1	1
Wyoming	1				1							
Participants	244	21	20	26	25	17	24	32	28	14	20	17

APPENDIX E

Evaluation Data

RETOOL SUMMARY EVALUATION DATA FOR ALL WORKSHOPS HELD

(Based on a scale of 1 being the lowest for "no" up to the highest rating of 5 for "yes")

EVALUATION QUESTION	KY	DC	IL	HI	UT	AZ	MD	NASH	NY	KNOX	CA	AVG
1. Were the major goals of the session achieved?	4.94	4.67	4.50	4.74	4.54	4.68	4.60	4.76	4.85	4.80	4.63	4.70
2. Was the training content relevant?	5.00	4.78	4.85	4.74	4.28	4.54	4.67	4.77	5.00	4.76	4.61	4.73
3. Were the facilities and equipment adequate?	4.88	4.89	4.00	4.78	4.65	4.68	4.71	4.81	4.70	4.77	4.46	4.67
4. Were the training activities well organized?	4.94	4.22	4.44	4.78	4.27	4.68	4.71	4.68	4.85	4.77	4.63	4.63
5. Was the allocation of time for specific tasks appropriate?	4.31	4.22	3.36	4.73	4.07	4.55	4.46	4.43	4.31	4.46	4.43	4.30
6. Were the workshop leaders knowledgeable about the training topic?	5.00	4.89	4.93	4.96	4.75	4.82	4.93	4.97	5.00	4.96	4.87	4.92
7. Did the workshop leaders present information effectively?	4.94	4.44	4.50	4.77	4.18	4.61	4.50	4.75	4.89	4.88	4.80	4.66
8. Were workshop leaders responsive to participants' individual needs?	5.00	4.67	4.93	4.88	4.65	4.78	4.93	4.87	4.96	4.64	4.83	4.83
9. Were the training materials adequate?	4.94	4.56	4.29	4.48	4.45	4.63	4.21	4.67	4.92	4.67	4.61	4.58
10. Did you enjoy today's training activities?	5.00	5.00	4.93	4.84	4.63	4.53	4.82	4.80	4.96	4.85	4.62	4.82
Number of completed evaluations:	16	15	22	27	42	38	14	25	9	18	15	22

EVALUATION SUMMARY FROM THE ROUNDTABLE ON SPECIAL EDUCATION TECHNOLOGY IN THE HIGHER EDUCATION CURRICULUM

SESSION EVALUATION QUESTION	1	2	3	4	AVG
1. Were the major goals of the session achieved?	4.52	4.25	4.40	4.20	4.34
2. Was the content relevant?	4.40	4.45	4.40	4.26	4.38
3. Were the facilities and equipment adequate?	4.54	4.21	3.90	3.33	4.00
4. Were the session activities well organized?	4.59	4.15	4.25	4.00	4.25
5. Was the allocation of time for specific tasks appropriate?	4.00	3.50	3.85	3.64	3.75
6. Did the workshop leaders present information effectively?	4.66	4.61	4.41	4.46	4.54
7. Did you enjoy the session?	4.59	4.45	4.35	4.33	4.43
Number of completed evaluations:	22	20	20	15	19

*** MATERIALS ***

Relevance of content	4.60
Clarity of content	4.00
Readability of content	4.00
Effectiveness of format	3.73
Overall quality of content	4.26

SAMPLE

Project RETOOL: Training in Advanced Technology Applications for Post-Doctoral Leadership Personnel

Authoring System Workshop
University of Illinois at Urbana-Champaign
April 16-18, 1987

Evaluation is a very important component of Project RETOOL. Project staff use the information gathered from workshop participants to plan and revise training activities and to determine the overall success of the project. Please take a few minutes to complete the following form by circling the appropriate number for each question. We also appreciate your comments and suggestions.

1. Were the major goals of the session achieved?

No 1 2 3 4 5 Yes

2. Was the training content relevant?

No 1 2 3 4 5 Yes

3. Were the facilities and equipment adequate?

No 1 2 3 4 5 Yes

4. Were training activities well organized?

No 1 2 3 4 5 Yes

5. Was the allocation of time for specific tasks appropriate?

No 1 2 3 4 5 Yes

6. Were the workshop leaders knowledgeable about the training topic?

No 1 2 3 4 5 Yes

7. Did the workshop leaders present information effectively?

No 1 2 3 4 5 Yes

8. Were workshop leaders responsive to participants' individual needs?

No 1 2 3 4 5 Yes

9. Were the training materials adequate?

No 1 2 3 4 5 Yes

10. Did you enjoy the workshop?

No 1 2 3 4 5 Yes

Other comments and suggestions: